"COMPARE THE EFFECTIVENESS OF MULLIGAN MOBILISATION TECHNIQUE VERSUS MAITLAND MOBILIZATION TECHNIQUE ALONG WITH STRETCHING ON SHOULDER INTERNAL RANGE OF MOTION, PAIN AND INSTABILITY IN OVERHEAD ALTHLETS WITH GLENO HUMERAL INTERNAL ROTATION DEFICIT"

Dissertation

Submitted to

The Tamilnadu Dr. MGR Medical University

In partial fulfilment for the degree of

MASTER OF PHYSIOTHERAPY

(SPORTS PHYSIOTHERAPY)

271750122

CHERRAAN'S COLLEGE OF PHYSIOTHERAPY

CHERRAAN'S INSTITUTE OF HEALTH SCIENCES

COIMBATORE, TAMILNADU, INDIA

MAY-2019

CERTIFICATE

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The work embodied in the thesis entitled **"COMPARE THE EFFECTIVENESS OF MULLIGAN MOBILISATION TECHNIQUE VERSUS MAITLAND MOBILIZATION TECHNIQUE ALONG WITH STRETCHING ON SHOULDER INTERNAL RANGE OF MOTION, PAIN AND INSTABILITY IN OVERHEAD ALTHLETS WITH GLENO HUMERAL INTERNAL ROTATION DEFICIT"** submitted to THE TAMIL NADU DR. M.G.R MEDICAL UNIVERSITY, Chennai-32 in the partial fulfilment of the requirement for the degree of Master Of Physiotherapy (Sports Physiotherapy) was carried out by candidate bearing register number **271750122** at Cherraan's College Of Physiotherapy, Coimbatore under my supervision. This is an original work in part or full for any other degree/diploma at this or any other university/Institute. This thesis is fit to be considered at this or any other university/Institute. This thesis is fit to be considered for evaluation of Master of Physiotherapy.

……	……
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ASSISTANT PROFESSOR	PRINCIPAL & PROFESSOR
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Internal Examiner	External Examiner

Project work evaluated on _____

DECLARATION

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The work embodied in this project entitled **"COMPARE THE EFFECTIVENESS OF MULLIGAN MOBILISATION TECHNIQUE VERSUS MAITLAND MOBILIZATION TECHNIQUE ALONG WITH STRETCHING ON SHOULDER INTERNAL RANGE OF MOTION, PAIN AND INSTABILITY IN OVERHEAD ALTHLETS WITH GLENO HUMERAL INTERNAL ROTATION DEFICIT"** submitted to **THE TAMILNADU DR. M.G.R. MEDICAL UNIVERSITY, CHENNAI,** in partial fulfilment for the degree of **MASTER OF PHYSIOTHERAPY,** was the original work carried out by me and has not been submitted in part or full for any other degree/diploma at this or any other institute/university. All the ideas and references have been duty acknowledgement

_____ _____

Signature of supervisor Signature of student

Mr. A. CHINNASAMY MPT (Sports)

Date: _____

Place: _____

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ABSTRACT

ABSTRACT

INTRODUCTION: Gleno Humeral Internal Rotation Deficit is an adaptive process in which the throwing shoulder experience a loss of internal rotation currently, GIRD can be defined by a loss of 20% of internal rotation to contralateral shoulder. GIRD is pathologic and decreased IR compared to nonthrowing shoulder can exit without concomitant shoulder pathology when total rotational motion of shoulder is symmetric. This is partly due to increased retrotorsion of the humerus which shifts the arc of motion more posteriorly (external). Pathologic GIRD, in contrast, exists when there is a loss of TRM >5° compared to the contralateral shoulder. This 5° change has been associated with decreased shoulder strength and increased injury rates in baseball players

OBJECTIVES: To compare effects of Mulligan Mobilisation Technique Versus Maitland Mobilization Technique Along With Stretching On Shoulder Internal Range Of Motion, pain And instabiity in Overhead althlets with Gleno Humeral Internal Rotation Deficit.

METHOD AND SUBJECTS: Among 44 subjects, 14 were excluded, the remaining 30 subjects age group 18-40 years, were recruited, this study was quasi-experimental comparative design this was conducted at Cherran's College Of Physiotherapy Out-Patient Department Coimbatore by simple random sampling method. 15 subject were selected in each group of intervention. GROUP A Mulligan Mobilization technique with stretching and stabilization exercises and GROUP B Maitland Mobilization technique with stretching and stabilization exercises. Both groups were treated 4 days per week for 6 weeks, one session daily. All subjects were measured for lnternal ROM by Goniometer, Pain by Numerical pain rating scale and instability by Oxford shoulder instability score (OSI). Data were analyzed by SPSS-20 to determine the effects of both the treatment regimens and compared with each other.

RESULTS: The Group A (Mulligan Mobilization Technique) for the IR ROM Pre and Post-test mean value 43.40 and 63.53, 't' value is 19.41 ($p< 0.0001$). Pain Pre and Post-test mean value 3.80 and 0.67,'t' value is 7.39 ($p< 0.0001$). Instability Pre and Post-test mean value 44.33 and 52.60,'t' value is 7.8157 ($p< 0.0001$). The result shows that Mulligan Mobilization Technique is an effective technique for improving ROM and reducing pain and instability among GIRD subjects. The Group B Maitland Mobilization Technique for the IR ROM Pre and Post-test mean value 45.13 and 57.93, 't' values is 34.80 ($p<0.0001$). Pain Pre and Post-test

mean value 3.53 and 1.20,'t' value is 6.46 ($p<0.0001$). Instability Pre and Post-test mean value 45.27 and 50.40,'t' value is 9.4678 ($p<0.0001$). The result shows that Maitland Mobilization Technique is an effective technique for improving ROM and reducing pain and instability among GIRD subjects. Group A and B for IR ROM Post-test mean value 63.53 and 57.93, the 't' value is 3.0441 ($p=0.050$). Group A and B for Pain post-test mean value 0.67 and 1.20, the 't value is 1.26 ($p=0.0001$). Group A and B for Instability post-test mean value 52.60 and 50.40, the 't value is 1.8812 ($p=0.0704$). The pre and post test results of Group A and Group B shows that there is a statistical and clinical significant effect of each technique for an improving ROM and reducing pain and instability among GIRD subjects. When both Group A and Group B where compared on between group analysis, the result shows that Mulligan Mobilization Technique is more effective than Maitland Mobilization Technique for an improving ROM and shows insignificant result for pain and instability among GIRD subjects.

CONCLUSION: It shows that there is a clinical significant improvement of patient's complaints in both groups. But the statistical inference shows that Mulligan mobilization technique is more effective when compared to the Maitland mobilization technique in improving internal range of motion and for pain and instability both treatments gave equal effectiveness.

KEYWORD: Overhead Althlets, Gleno Humeral Internal Rotation Deficit, Mulligan Mobilization Technique, Maitland Mobilization Technique, Range Of Motion, Oxford Shoulder Instability Score.

INTRODUCTION

CHAPTER I

INTRODUCTION

1.1. BACK GROUND OF THE STUDY:

The shoulder plays a vital role in many athletic activities. Throwing appears as one of the main gestures which involve this joint being present in many sports such as baseball, handball, tennis and basketball, with different techniques depending on each sport though. Athletes who practice throws above the head present higher probability in developing shoulder injuries.

The physical exam of throwing athletes may present adaptations in the Range of motion of medial and lateral rotation of the dominant shoulder when compared with the non-dominant one. Such fact may be confirmed by the results of many studies which demonstrate significant increase of glenohumeral lateral rotation (LR) and decrease in the medial rotation (MR) on the shoulder of throwers. The deficit in the medial rotation of the dominant shoulder compared with the non-dominant is named GIRD (glenohumeral internal rotation deficit).

It is believed that the reason for this alteration is the result of a natural adaptation of the shoulder developed in throwing athletes. Theories correlate the increase of lateral rotation and the GIRD with the presence of microtrauma in the static and dynamic restrictors, involving contracture of the posterior capsule and bone adaptations in the humerus version.

There are many hypothesis on the etiology of the deficit of the medial rotation, one of them states that it is a result of a contracture and thickening of the postero-inferior portion of the glenohumeral capsule, which occurs due to the repetitive microtrauma during the phases of late cocking and follow-through of the throwing movement. In that case, the loss of medial rotation exceeds the lateral rotation gain; thus, the deficit is attributed to the alterations in the soft tissues, being considered pathological.Some authors suggest that the bone adaptations interfere on the range of motion alteration as much as the soft tissues adaptations.

They mention that the retroversion increase of the proximal humerus results in increase of lateral rotation with consequent decrease of medial rotation. In those cases, it is observed by the authors that the total Range Of Motion of shoulder rotation (lateral rotation plus medial rotation) is equal both on the dominant and non-dominant shoulder; that is to say, for each acquired degree of lateral rotation, one degree of medial rotation is lost. It is believed that this is a physiological adaptation which does not cause damage to the shoulder function.

Due to the suggestive correlation between alterations in shoulder mobility in throwers and injuries, added to the lack of articles involving basketball athletes, the aim of this study was to verify the existence of alterations in mobility of the glenohumeral articulation in professional basketball athletes as well as to verify the existence of correlation between Range of motion of Internal rotation and shoulder posterior shortening.

The throwing motion is an extremely complex process in which remarkable velocities and extreme forces are repetitively generated. Mobility and stability are often directly at odds with each other, leading to the idea of the "thrower's paradox" coined by Wilk et al. While throwers may not complain of frank instability, they do have a component of pathologic laxity or micro instability that predisposes them to injury. Balancing this dichotomy allows athletes to achieve maximal performance while pitching. The goal of this review is to provide an update on the diagnosis, associated pathology, and treatment of GIRD in throwing athletes.

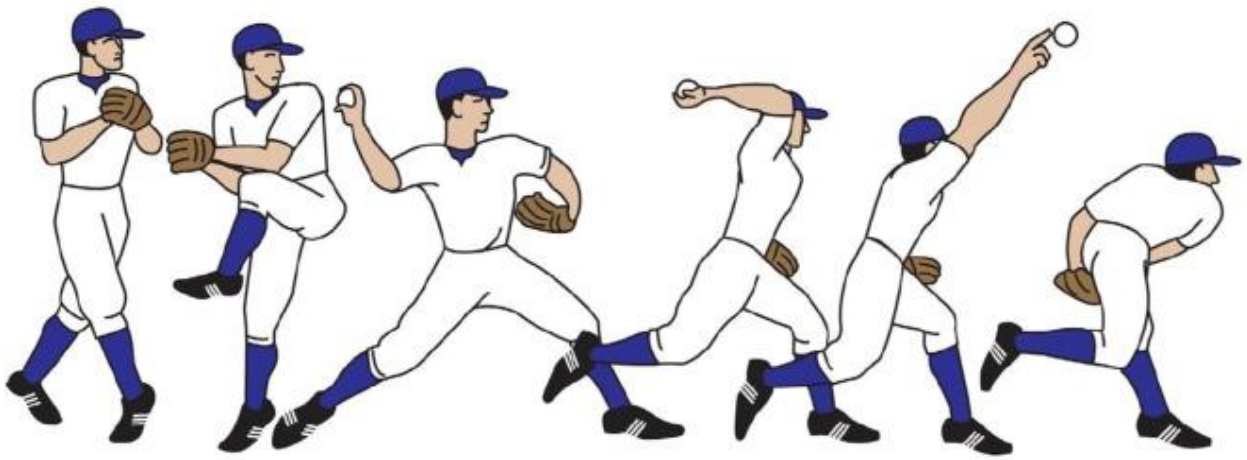


Figure 1

The six phases of the throwing motion: windup, early cocking, late cocking, acceleration, ball release and deceleration, and follow-through.

ANATOMY

GLENOHUMERAL JOINT

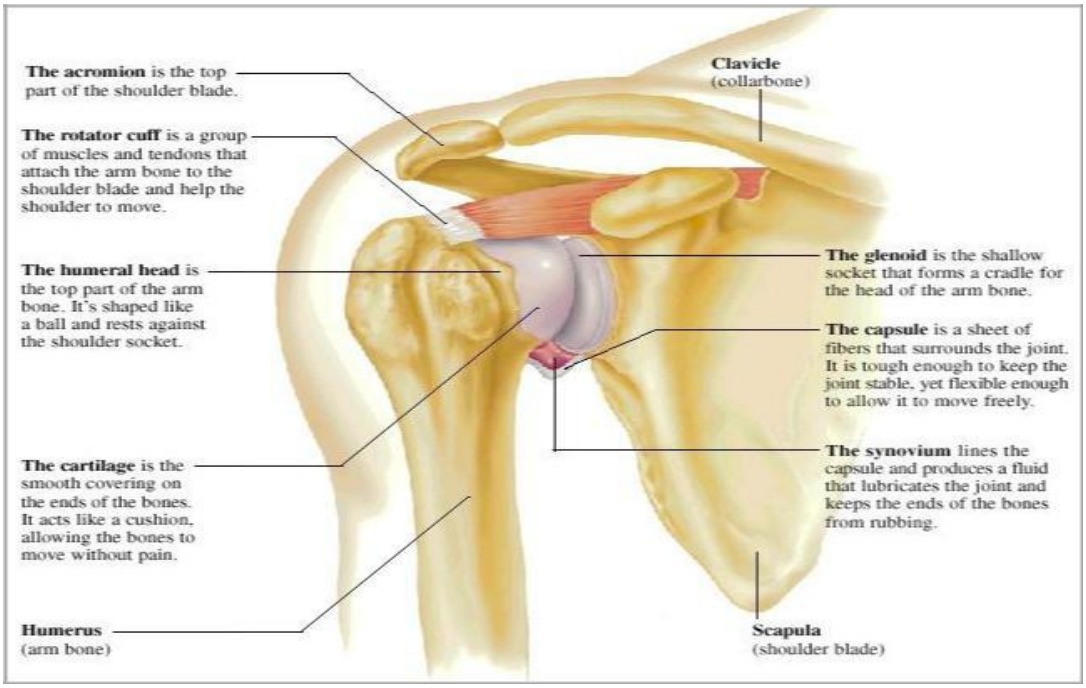
- The shoulder joint is a synovial joint of the ball and socket variety.
- Head of humerus is larger than the glenoid fossa.

GLENOID LABRUM:

The glenoidlabrum consists of fibro cartilage and fibrous tissue. The rim of fibro cartilagenous tissue attaches around the margin of glenoid fossa. Inner surface of the labrum is covered with synovium and other surface attaches to the capsule.

CAPSULE:

Capsule is a loose fitting which surround the joint and allowing the joint surface to separate 2 to 3mm by a distractive force. It gives stability to the joint.

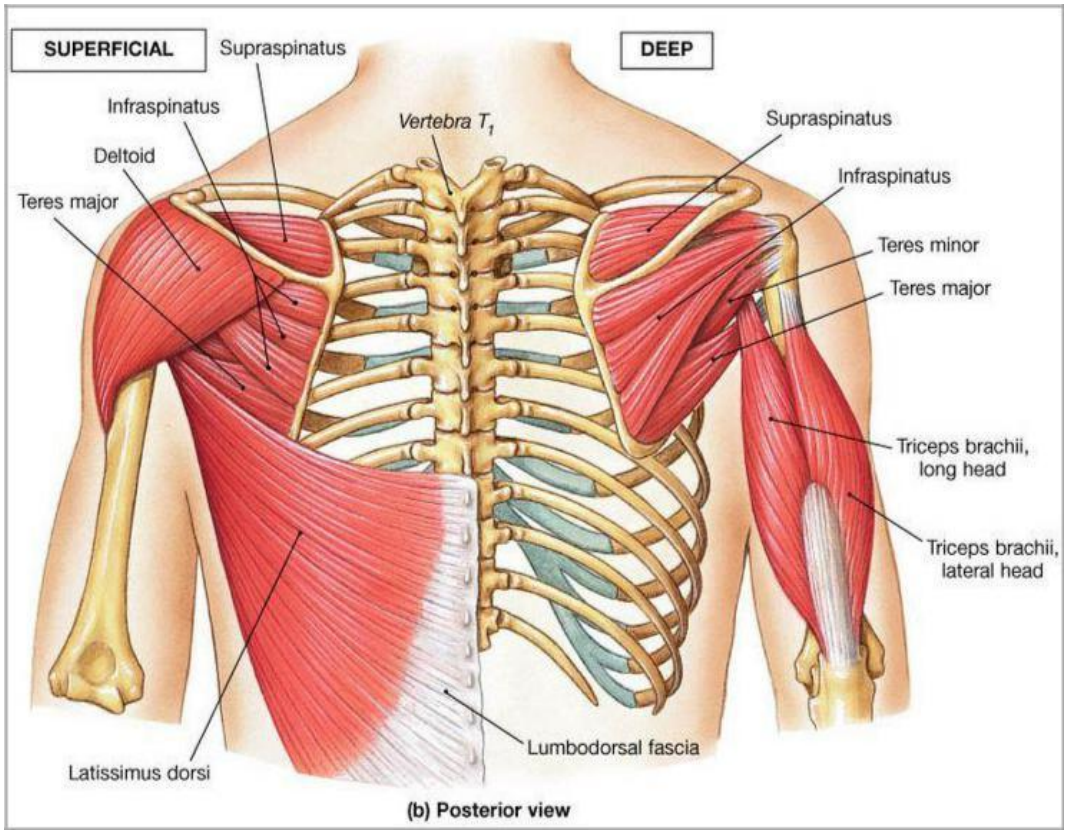


BLOOD SUPPLY:

- Anterior circumflex humeral vessels
- Posterior circumflex humeral vessels
- Suprascapular vessels
- Subscapular vessels

NERVE SUPPLY:

- Axillary nerve
- Musculocutaneous nerve
- Suprascapular nerve



SHOULDER MUSCLES:

SHOULDER FLEXION:

- Clavicular head of the Pectoralis major
- Anterior fibres of deltoid

SHOULDER EXTENSION:

- Posterior fibres of deltoid
- Latissimusdorsi

SHOULDER ADDUCTION:

- Pectoralis major
- Latissimusdorsi
- Short head of biceps brachii
- Long head of triceps brachi

SHOULDER ABDUCTION:

- Supraspinatus 0-15 degrees
- Deltoid 15-90 degrees
- Serratus anterior 90-180 degrees
- Upper and lower fibres of trapezius 90-180 degrees

MEDIAL ROTATION:

- Pectoralis major
- Anterior fibres of deltoid
- Latissimusdorsi
- Teres major

LATERAL ROTATION:

- Posterior fibres of deltoid
- Infraspinatus
- Teres minor

NORMAL RANGE OF MOTION:

- Flexion 0-180 Degrees
- Extension 0-45 Degrees
- Abduction 0-180 Degrees
- Adduction 180-0 Degrees
- External Rotation 0-70 Degrees
- Internal Rotation 0-90 Degrees

1.2. NEED OF THE STUDY :

This condition resulting in the loss of Internal rotation of the glenohumeral joint as compared to the contralateral side. It occurs primarily in overhead athlets often seen in throwing athletes. GIRD affects 33% of the sports population and it is the main cause for reduced shoulder internal rotation range and pain.

Currently, physical therapists used for the management of this condition are rest, strectching strengthening and manual therapy.

Mulligan mobilization technique versus Maitland mobilization technique along with stretching play important part of intervention in glenohumeral internal rotation deficit (GIRD) by improving Internal Rotation range of motion and reducing pain and instability.

1.3. AIM OF THE STUDY:

The aim of the study was to find out the effects of Mulligan Mobilisation Technique Versus Maitland Mobilization Technique along with Stretching on Shoulder Internal range of motion, pain and instability in overhead athlets with Gleno Humeral Internal Rotation Deficit.

1.4. OBJECTIVES OF THE STUDY :

To find out the effects of Mulligan mobilization technique with stretching on shoulder internal rotation range of motion, pain and instability in Overhead athlets with Gleno Humeral Internal Rotation Deficit.

To find out the effects of Maitland mobilization technique with stretching on shoulder internal rotation range of motion, pain and instability in Overhead althlets with Gleno Humeral Internal Rotation Deficit.

To compare the effects of Mulligan Mobilisation Technique Versus Maitland Mobilization Technique along with Stretching on Shoulder internal rotation range of motion, pain and instability in Overhead athlets with Gleno Humeral Internal Rotation Deficit.

1.5. HYPOTHESIS :

NULL HYPOTHESIS (Ho)

There will be no significant difference between the effects of Mulligan Mobilization Technique Versus Maitland Mobilization Technique along with Stretching on shoulder internal rotation range of motion, pain and instability in Overhead athlets with Gleno Humeral Internal Rotation Deficit.

ALTERNATIVE HYPOTHESIS (Ha)

There will be significant difference between the effects of Mulligan Mobilization Technique Versus Maitland Mobilization Technique along with Stretching On Shoulder internal rotation range of motion, pain and instability in Overhead athlets with Gleno Humeral Internal Rotation Deficit.

1.6 OPERATIONAL DEFINITION

GIRD:

Gleno Humeral Internal Rotation deficit is a loss of Internal rotation in the presence of loss of total rotational motion.

GIRD = (side to side difference in External rotation) + (side to side difference in Internal rotation).

PAIN:

An unpleasant sensory and emotional experience associated with actual or potential tissue damage.

RANGE OF MOTION:

Range of motion the measurement of movement around a specific joint or body part.

Anatomical position to extreme limited of the motion.

FUNCTIONAL ACTIVITIES:

Activities are required to perform the functional activities included working setting of

daily living**.**

MULLIGAN MOBILIZATION TECHNIQUE:

It is a Mobilization with Movement is the concurrent application of sustained accessory mobilization applied by a therapist and an active physiological movement to end range applied by the patient.

MAITLAND MOBILIZATION TECHNIQUE:

It is a passive, skilled manual therapy technique applied to the joints and related soft tissues at varying speed and amplitudes using physiological or accessory motion for therapeutic purposes.

STRETCHING:

It is a form physical exercise in which a specific muscle or tendon or muscle group is deliberately flexed or stretched in order to improve the muscles felt elasticity and achieve comfortable muscle tone. The result is a feeling of increase muscle control flexibility and range of motion.

SHOULDER STABILIZATION EXERCISES:

Exercise programs focused on improving scapular stabilization should include exercises to increase strength and endurance in the muscles that act on the scapula, increasing muscle length to correct inhibited ROM, and retraining the body to have better posture with good scapular positioning.

REVIEW OF LITERATURE

CHAPTER II

REVIEW OF LITRATURE

SECTION A: Studies on Sleeper stretch

SECTION B: Studies on Mulligan Mobilization

SECTION C: Studies on Maitland Mobilization

SECTION D: Studies on Stabilization exercise

SECTION A: Studies on Sleeper stretch

I. **Reuther KE (2016) Co**nducted a study to evaluate the effect of sleeper stretch on the time course for recovery of internal rotation after athrowing episode. 17 baseball players were enrolled in this study aged between 15 to 18 years. Glenohumeral IR and ER were evaluated in the dominent shoulder before and after pitching with sleeper stretch on 1st week and no sleeper stretch on 2nd week.The result shown significant improvement in commonly observed IR loss and the effects observed over the course of season.

II. **Launder KG (2008)** conducted a study on acute effects of sleeper stretches on shoulder Range of motion. 66 players were included in this study and divided into 2 groups. Participants in group A were active baseball players whereas in group B were players with no recent participation(within 5 years)measurement were taken before and after sleeper stretch. The result shown sleeper stretch produced significant acute increase in posterior shoulder flexibility and shoulder range of motion no difference were observed in non thrower group.

III. **Chepeha JC (2018)** conducted a study on effectiveness of posterior strtching program on university level overhead athlets.37 overhead athlets were selected of which 19 were randomized into intervention group and 18 were randomized into control group.Intervention group performed sleeper stretch daily for 8 weeks whereas control group performed usual activities. The results revealed significantly increse range of motion and Had range of motion after performing a posterior shoulder stretch.

IV. **Yamauchi (2016)** Conducted a study on efficacy of two stretching methods on shoulder range of motion and muscle stiffness in baseball players with posterior shoulder tightness.Twenty four college baseball players with Range of motion limitation were randomly assigned to the modified cross-body stretch or modified sleeper stretch group. Intervention period was 4 weeks. Both group experienced a significantimprovement in range of motion, Horizontal adduction range of motion and reduced muscle stiffness.

V. **Rachel cherter (2014)** Evaluated the efficacy of stretches in the prevention and treatment of glenohumeral internal rotation deficit on overhead athlets.Six studies met the inclusion criteria,veriety of stretching intervention were utilized,ranging fRange of motion single stretches to multiple position stretching program.The result concluded a weak evidence to suggest that stretches may be effective in reducing GIRD in subjects with asymptomatic shoulder pain.

SECTION B: Studies on Mulligan Mobilization

I. **Sreenivasu Kotagiri (2018)** Conducted a comparitive study on effectiveness of mobilization with exercise vs Mulligan Internal Rotation Movement in patients with glenohumeral internal rotation deficit . In this study 60 patients aged between 18-50 years were selected through simple random sampling. The subjects selected in group A gain mobilization with stabilization exercise and group B Mulligan mobilization with posterior capsule stretching . The results showed significant improvement in Range of motion and internal rotation in both groups, but Mulligan mobilization with posterior capsule stretching is more effective than with the other group.

II. **Bisset et al., (2006)**Conducted a study in subjects with shoulder dysfunction. The participants performs the movement to the point of pain onset. The glide should be applied close to the joint line to avoid unnecessary movement and the direction of the glide should be parallel to the joint line such that it achieves the greatest improvement in the patient's movement. Mulligan suggests a "tweaking" of the direct ion of the glide to achieve the greatest effect with the least amount of force required. MWM is effective in reducing pain and increasing ROM .

III. **Vicenzino et al., (2011)** advocates the application of tape to enhance the positive effects of Mulligan MWM for Shoulder range of motion deficit. Tape is applied to augment the direction of applied MWM force and is usually left on the patient for a maximum of 48 hours following the application of the MWM. There is some evidence to support the advantages of application of either rigid or elastic tape to patients with shoulder impingement (Ketola et al., 2009; McConnell & McIntosh, 2009; Pogliaghi &Malgrati, 1998). The goal of tape application following glenohumeral MWM is to enhance the MWM's effects on shoulder pain and dysfunction. Further studies to assess these possible beneficial effects in a shoulder impingement population following application of the glenohumeral MWM are needed to verify this tenet.

IV. **Teys P, Bisset (2003)** Conducted a study to investigate the time course of the effects of a single MWM technique and to ascertain the effects of adding tape following MWM in people with shoulder pain and dysfunction. Twenty-five participants (15 males, 10 females) were randomly assigned to MWM or MWM-with-tape interventions. ROM, PPT and current pain severity (PVAS) were measured pre- and post-intervention, at 30 minutes, 24 hours and one-week follow-up. Following a one-week washout period, participants were crossed over to receive a single session of the opposite intervention with follow-up measures repeated. It appears that both MWM and MWM-with-tape provide an immediate improvement in pain and ROM. MWM-with-tape also provides a sustained improvement in Range of motion.

V. **Djordjevic et al., (2012**) Proved that Mulligan's glenohumeral MWM is effective in providing immediate improvement in shoulder pain and dysfunction. A single application of glenohumeral MWM has demonstrated immediate positive effects in improving pain and range of movement in a shoulder pain population when compared with placebo and controls. It has also demonstrated a positive effect in terms of improved pain-free movement for at least one week when tape is added.

VI. Another trial found comparing the effects of gong's mobilization and mobilization with movement techniques for improving pain and function of shoulder affected with capsulitis. This study concluded both techniques equally effective, combined with conventional therapies.

SECTION C: Studies on Maitland Mobilization

I. **Vermeulen et al, (2000)** Conducted a study to evaluate the impact of Maitland mobilization on shoulder range of motion. Subjects were randomly selected with limited shoulder Range of motion. Result shown end of range and accessory Maitland mobilization, where shall passive oscillatory joint movements are performed to the glenohumeral joint can be beneficial in increasing shoulder Range of motion.

II. In one randomised controlled trial (RCT) (**Maricar and Chok, 1999**) end of range Maitland mobilization was evaluated alongside an exercise program in 32 participants with shoulder deficit. All participants received similar exercise regime within treatment sessions and a similar home exercise program. The study found no statistical difference between those who received 15-minutes of end of range Maitland mobilization and exercises against the exercise group although comparatively the group that received the Maitland mobilization had better clinical improvement in terms of the speed of regaining the full shoulder mobility.

III. **Vermeulen et al, (2000)** conducted a study in the form of a case series using 7 participants with recalcitrant shoulder capsulitis evaluated the effectiveness of accessory Maitland mobilization without any exercise program. This study used a variety of mobilizations delivered twice a week for 12 weeks, each session lasting 30 minutes and found the mobilizations to be beneficial in improving all shoulder motions and joint capsule capacity (distension volume). This study however, performed the mobilization using a variety of Maitland techniques and therefore the beneficial effects could not be attributed to one particular gliding techniques.

IV. **Roubal, Dobritt and Placzek (1996)** evaluated a specific gliding techniques where two directions of glenohumeral gliding, anteroposterior in flexion and longitudinal caudad in abduction were performed to 8 participants diagnosed as having recalcitrant adhesive capsulitis. These were delivered as translational gliding manipulation with interscalene brachial plexus block and found to be sufficient in restoring the glenohumeral movements

in flexion, abduction, external and internal rotations. It was proposed these two directions of gliding could be beneficial in restoring shoulder motions even when the force was delivered as mobilization.

V. **Tarcy J. Brudreg (2019)** conducted a comparative study to evaluate the effect of therapeutic exercise and mobilization on patients with shoulder dysfunction. Six databases were searched for randomized controlled trials with either clinically or radiografically confirmed shoulder dysfunction resulting in pain restriction of Range of motion and limitation of function. The is inconclusive with respect to the beneficial effects of the combination of therapeutic exercise and joint mobilization versus therapeutic exercise alone.

SECTION D: Studies on Stabilization exercise

I. **Chon SC, Jeon NY (2018)** conducted a study to compare the effect of glenohumeral stabilization exercise combined with scapular stabilization exercise on changes in shoulder function in patients with shoulder pain. They were measured shoulder stability, Scapular alignment, pain, muscle power and range of motion before and after intervention in both groups.40 subjects were randomly assigned to an experimental and control group. This study suggests that GSE positively affects shoulder stability and pain control in patients with shoulder pain and instability.

II. **Demer K, Dannels .C (2012),** Done a 6 weeks study on scapular muscle rehabilitation exercise in overhead athletes with impingement symptoms. 47 overhead athletes were included in this study 25 men and 22 women, before and after 6 weeks program it demonstrate that scapular muscle rehabilitation improve pain and function based on SPADI scores and reduce relative trapezius muscle activation.

III. **Wilk KE, Yenchak AJ (2011)** They were done a new sets of exercise named advanced throwers ten exercise for enhanced dynamic shoulder control in the overhead throwing athletets. This expanded program incorporates throwing motion specific exercise and utilizing principles of co activation, high level neuromuscular control, dynamic stabilization, muscle facilitation, strength and co-ordination which all serve to restore muscle balance and symmetry in overhead throwing athletes. They received a excellent result, that is players who received these sets of exercise gained higher level of humeral head control necessary for the overhead throwing athletes.

IV. **Kevin E, Wilk PT (2016)** Conducted a study on rehabilitation of overhead throwing athletes. Their program were specific strengthening and flexibility exercise to achieve the dynamic stability rather just strengthening internal and external rotators. The multiphased rehabilitation program allows for the restoration of strength, mobility, endurance and power. They concluded that experimental group shows better improvement in shoulder

control and returned to unrestricted sporting activity than control group with only internal and external rotators strengthening.

V. **Wilk KE, Hooks TR (2014**) Done a study on rehabilitation of the throwing athletes. Their treatment regime was individualized and it depends on accurate evaluation to evaluate the causative factors for an athletes pathology. In their study they have concluded specific strengthening and flexibility exercise improve dynamic shoulder stability that is required for overhead throwing athletes.

MATERIALS AND METHODOLOGY

CHAPTER III

METHODOLOGY

3.1. STUDY DESIGN:

- A Prospective, open labelled, quasi-experimental comparative design.

3.2. STUDY SETTING:

- Cherran's College Of Physiotherapy Out-Patient Department Coimbatore.

3.3. SAMPLE METHOD:

- Simple random sampling method.

3.4. SELECTION CRITERIA:

INCLUSION CRITERIA:

- Both male and female
- Age group 18-40 yrs
- Subjects with minimum 50% reduction AROM/PROM in the internal rotation Range of motion were taken
- Compared to the unaffected side.
- Subjects being engaged in sport that required athletes arm to be above shoulder height on a repetitive basis during throwing.
- Who will consent to participate in the study
- Belly compression test positive

EXCLUSION CRITERIA:

- upper limb neurological deficit
- All the objects having any intra articular injection
- ligament and muscle injury
- History of upper limb fracture and dislocation

- Any pathology neck pain
- thoracic outlet syndrome
- Rotator cuff tears
- myocardial infarction
- Red flags to mobilization

3.5. STUDY DURATION:

- The period of study was 8 months

3.6. STUDY MATERIALS:

- Assessment chart
- Goniometer (universal)
- Bill / belt
- Theraband
- Swiss ball
- Treatment couch, Bed sheet, Pillows and towel, Pen, Timer

3.7. TREATMENT DURATION:

- The period of study was 4 days per week for 6 weeks, one session daily

3.8. OUTCOMES MEASURES:

- Range of motion (ROM)
- Oxford Shoulder Instability Score (OSI)
- Numerical pain rating scale (NPRS)

3.9. INTERVENTION:

- **GROUP A -** 15 Subjects – Received Mulligan Mobilization Technique with stretching and Stabilization exercise.
- **GROUP B -** 15 Subjects – Received Maitland Mobilization Technique with stretching and Stabilization exercise.

3.10 PROCEDURE

The subjects were divided into two groups; Group A and Group B, 15 patients in each group. All the subjects were randomly selected and assigned to each group. A pretest measurement with the help of three measures - Numerical pain rating scale for pain, goniometer for an internal range of motion of shoulder and Oxford Shoulder Instability Score (OSI) for instability was done in each group.

GROUP-A MULLIGAN MOBILIZATION TECHNIQUE WITH STRETCHING:

POSITION:

Subject: The subject sitting on a high plinth with affected hand behind back in available end range

Therapist: standing towards the affected side

TECHNIQUE:

Mobilization with Movement.

PROCEDURE:

Web of therapist one hand approaching from front, grasps the subject's elbow at cubital fossa. Dorsum of his other hand approaching from back stabilizes the scapula, deep in the subject's axilla. This is for delivering distraction at gleno-humeral joint. Therapist glides the head of the humerus inferiorly by pushing it down from the cubital fossa and distracting gleno-humeral joint with other hand. The subject now performs end range internal rotation by pulling his hand up with the help of his other hand or mobilization belt. Therapist gives passive overpressure at the end of range using his body/belt.

Mulligan MWM was applied for four days continuously by following the rule of 3 i.e. 1st day 3 glides, 2nd day 3 sets of six glides, 3rd day 3 sets of 10 glides were given and 4th day again 3 sets of 10 glides was given. A patient who failed to come for 4 days continuously was discontinued from the study. The treatment was applied four times per week, for six weeks, for a total of 24 times.

Posterior Capsule Stretching Lie in a semi-side lying position, place your shoulder and elbow at 90 degree, slowly lower your forearm towards the bed till you feel a comfortable stretch at the back of the shoulder. Hold the stretch for 15seconds and repeat 10 times. The stretching program lasted for a period of six weeks.

The shoulder stabilization exercises were done. Ten repetitions were considered as one set, and the subjects conducted three sets. A break of 3 minutes was given between each set. This program lasted for a period of six weeks.

GROUP- B MAITLAND MOBILIZATION TECHNIQUE WITH STRETCHING:

POSITION:

Position of patient: Prone with the arm supported over thigh the acromion stabilized with padding.

Examiner position: Walk standing position.

TECHNIQUE:

Posterio- anterior glide

GRADING:

Grading: Grade- III & IV

PROCEDURE:

Forward stride position, the participants arm supported against thigh and outside hand. This position provides grading distraction, the ulnar border of the other hand placed just distal to the posterior angle of the acromion process. This proximal hand provides the mobilizing force posterior –anterior for gliding.

Posterior Capsule Stretching Lie in a semi-side lying position, place your shoulder and elbow at 90 degree, slowly lower your forearm towards the bed till you feel a comfortable stretch at the back of the shoulder. Hold the stretch for 15seconds and repeat 10 times. The stretching program lasted for a period of six weeks.

The shoulder stabilization exercises were done. Ten repetitions were considered as one set, and the subjects conducted three sets. A break of 3 minutes was given between each set. This program lasted for a period of six weeks.

DATA ANALYSIS AND RESULTS

CHAPTER-IV

STATISTICAL ANALYSIS AND INTERPRETATION

Data collected from Group A (Mulligan Mobilization Technique) and Group B (Maitland Mobilization Technique) were analyzed by using paired t- test to measure the changes between the pre and post-test values within the group and independent –t test was done to measure the changes between group analysis. All these statistical analysis were performed through SPSS-20 Version.

Paired 't' test :

$$t = \frac{\overline{d} \times \sqrt{n}}{SD}$$

$$SD = \sqrt{\sum \frac{(d - \overline{d})^2}{n - 1}}$$

Where,

d - Difference between pre test and post test values

$\bar{d} = \frac{\sum d}{n}$ Mean difference between pre test and post test values

n - Total number of subjects

s - Standard deviation

Unpaired' test:

The unpaired 't' test was used to compare the pretest and post test values between the two groups.

Formula for unpaired 't'test:

$$t = \frac{\overline{x}_1 - \overline{x}_2}{SD\sqrt{1/n1 + 1/n_2}}$$

$$SD = \sqrt{\frac{(n_1 - 1)(SD_1)^2 + (n_2 - 1)(SD_2)^2}{n_{1+}n_2 - 2}}$$

Where,

$\overline{x_1}$ = Mean of Group A

$\overline{x_2}$ = Mean of Group B

$\sum$ = sum of the value

n_1 = number of subjects in Group A

n2 =number of subjects in Group B

S =standard deviation

X1=difference between pre-test and post test group-A

X2 =difference between pre-test and post test group-B

TABLE: 1

MULLIGAN MOBILIZATION TECHNIQUE WITH STRETCH

PRE AND POST VALUES FOR INTERNAL ROTATION

RANGE OF MOTION(GROUP A)

OUTCOMES	ANALYSIS	MEAN	MEAN DIFFERENCE	STANDARD DEVIATION	t VALUE	p VALUE
SHOULDER IR ROM	PRE	43.40	20.13	5.59	19.41	0.0001
	POST	63.53				

TABLE: 2

MULLIGAN MOBILIZATION TECHNIQUE WITH STRETCH

PRE AND POST VALUES FOR PAIN

(GROUP A)

OUTCOME	ANALYSIS	MEAN	MEAN DIFFERENCE	STANDARD DEVIATION	t VALUE	p VALUE
PAIN (NPRS)	PRE	3.80	3.13	2.18	7.39	0.0001
	POST	0.67				

TABLE: 3

MULLIGAN MOBILIZATION TECHNIQUE WITH STRETCH

PRE AND POST VALUES FOR INSTABILITY

(GROUP A)

OUTCOME	ANALYSIS	MEAN	MEAN DIFFERENCE	STANDARD DEVIATION	t VALUE	p VALUE
SHOULDER (OSI SCORE)	PRE	44.33	8.27	5.15	7.81	0.0001
	POST	52.60				

GRAPH: 1

GRAPHICAL REPRESENTATION MULLIGAN MOBILIZATION TECHNIQUE (GROUP A)

WITHIN GROUP ANALYSIS ON RANGE OF MOTION, PAIN AND INSTABILITY

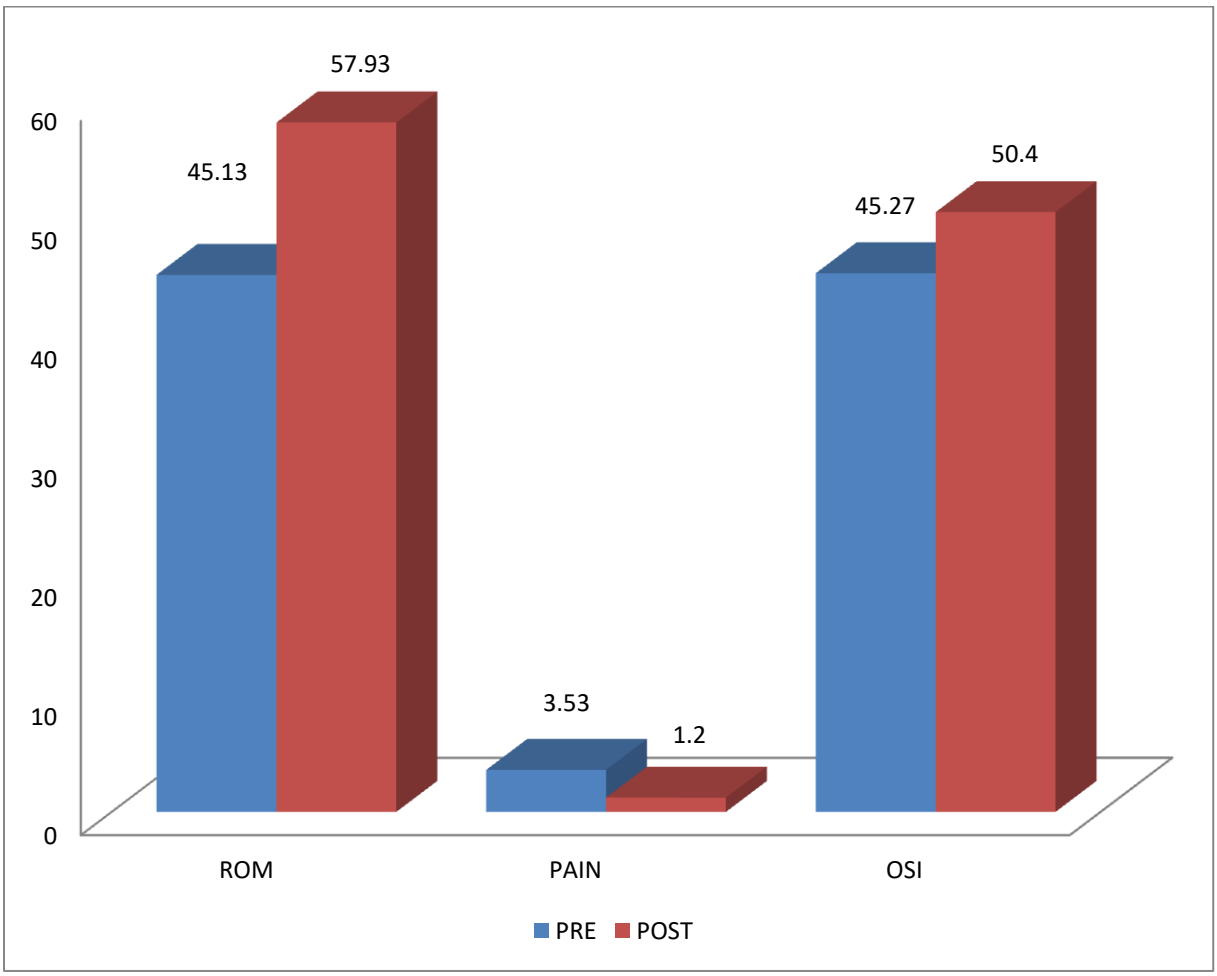


TABLE: 4

MAITLAND MOBILIZATION TECHNIQUE WITH STRETCH

PRE AND POST VALUES FOR INTERNAL ROTATION

RANGE OF MOTION (GROUP B)

OUTCOMES	ANALYSIS	MEAN	MEAN DIFFERENCE	STANDARD DEVIATION	t VALUE	p VALUE
SHOULDER IR ROM	PRE	45.13	12.80	6.50	34.80	0.0001
	POST	57.93				

TABLE: 5

MAITLAND MOBILIZATION TECHNIQUE WITH STRETCH

PRE AND POST VALUES FOR PAIN

(GROUP B)

OUTCOME	ANALYSIS	MEAN	MEAN DIFFERENCE	STANDARD DEVIATION	t VALUE	p VALUE
PAIN (NPRS)	PRE	3.53	2.33	2.64	6.46	0.0001
	POST	1.20				

TABLE: 6

MAITLAND MOBILIZATION TECHNIQUE WITH STRETCH

PRE AND POST VALUES FOR INSTABILITY

(GROUP B)

OUTCOME	ANALYSIS	MEAN	MEAN DIFFERENCE	STANDARD DEVIATION	t VALUE	p VALUE
SHOULDER (OSI SCORE)	PRE	45.27	5.13	5.44	9.46	0.0001
	POST	50.40				

GRAPH : 2

GRAPHICAL REPRESENTATION MAITLAND MOBILIZATION TECHNIQUE (GROUP B) WITHIN GROUP ANALYSIS ON RANGE OF MOTION, PAIN AND INSTABILITY

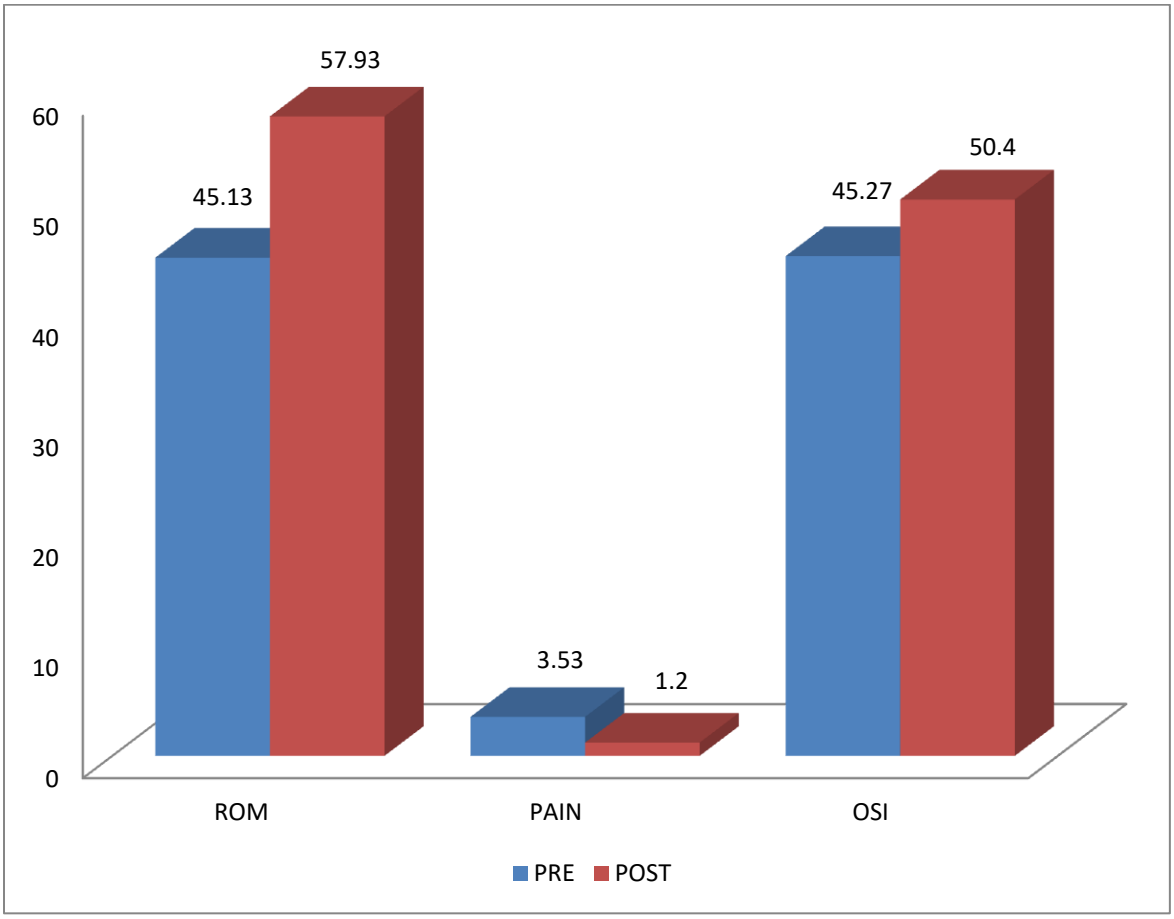


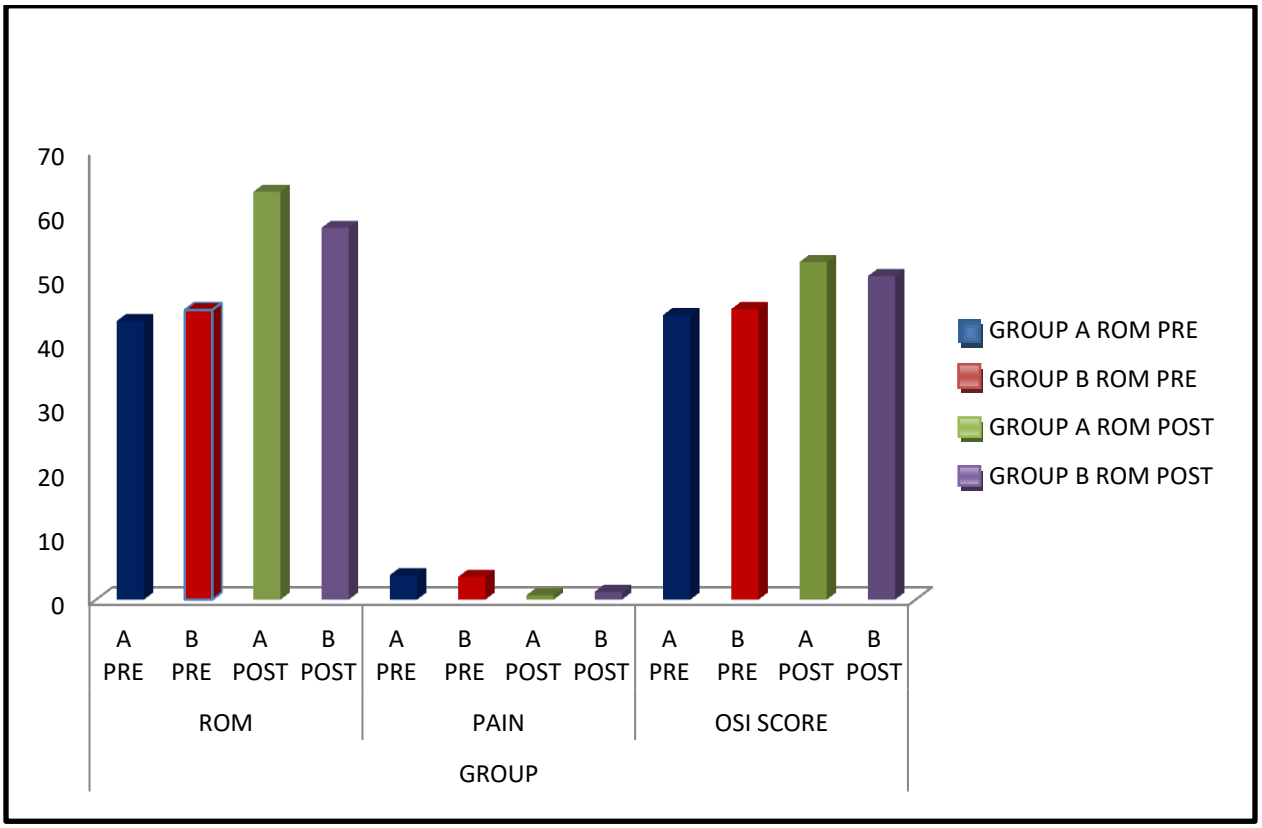
TABLE: 7

PRE AND POST TEST VALUES OF GROUP A AND GROUP B BETWEEN GROUP ANALYSIS

OUTCOME	ANALYSIS	GROUP	MEAN	t VALUE	p VALUE
SHOULDER IR ROM	PRE	A	43.4	0.7829	0.4402
	PRE	B	45.13		
	POST	A	63.53	3.0441	0.005
	POST	B	57.93		
PAIN (NPRS)	PRE	A	3.8	0.3016	0.7652
	PRE	B	3.53		
	POST	A	0.67	1.26	0.218
	POST	B	1.2		
OXFORD SHOULDER INSTABILITY SCORE-OSI	PRE	A	44.33	0.4823	0.6333
	PRE	B	45.27		
	POST	A	52.6	1.8812	0.0704
	POST	B	50.4		

GRAPH: 3

GRAPHICAL REPRESENTATION ON COMPARISON OF MULLIGAN MOBILIZATION TECHNIQUE AND MAITLAND MOBILIZATION TECHNIQUE ON RANGE OF MOTION, PAIN AND INSTABILITY



The Group A (Mulligan Mobilization Technique) for the IR ROM Pre and Post-test mean value 43.40 and 63.53, ‘t’ value is 19.41 ($p< 0.0001$). Pain Pre and Post-test mean value 3.80 and 0.67,‘t’ value is 7.39 ($p< 0.0001$). Instability Pre and Post-test mean value 44.33 and 52.60,‘t’ value is 7.8157 ($p< 0.0001$).

The result shows that Mulligan Mobilization Technique is an effective technique for improving ROM and reducing pain and instability among GIRD patients.

The Group B Maitland Mobilization Technique for the IR ROM Pre and Post-test mean value 45.13 and 57.93, ‘t’ values is 34.80 ($p<0.0001$). Pain Pre and Post-test mean value 3.53 and 1.20,‘t’ value is 6.46 ($p<0.0001$). Instability Pre and Post-test mean value 45.27 and 50.40,‘t’ value is 9.4678 ($p<0.0001$).

The result shows that Maitland Mobilization Technique is an effective technique for improving ROM and reducing pain and instability among GIRD patients.

Group A and B for IR ROM Post-test mean value 63.53 and 57.93, the ‘t’ value is 3.0441 ($p=0.050$). Group A and B for Pain post-test mean value 0.67 and 1.20, the ‘t value is 1.26 ($p=0.0001$). Group A and B for Instability post-test mean value 52.60 and 50.40, the ‘t value is 1.8812 ($p=0.0704$).

The pre and post test results of Group A and Group B shows that there is a statistical and clinical significant effect of each technique for an improving ROM and reducing pain and instability among GIRD patients.

When both Group A and Group B where compared on between group analysis, the result shows that Mulligan Mobilization Technique is more effective than Maitland Mobilization Technique for an improving ROM and shows insignificant result for pain and instability among GIRD patients.

DISCUSSION

CHAPTER V

DISCUSSION

This study was designed to know the efficacy of Mulligan mobilization technique with stretching and stabilization exercise in the treatment of glenohumeral internal rotation deficit for improving internal rotation ROM and reducing pain and instability by comparing with Maitland mobilization technique with stretching and stabilization exercise. This study included 2 groups: Group A and Group B. The results of this study indicate that group A shows a significant difference in the internal rotation range of motion when compared with group B . This study compared the effects of two treatment strategies; Mulligan mobilization technique with stretching and stabilization exercise and Maitland mobilization technique with stretching and stabilization exercise. Stretching exercise was taken in this study because **Reuther KE(2016)** have previously demonstrated that the baseball players with Glenohumeral internal rotation deficit can be treated successfully with stretching program.

During mobilization mechanical forces leads to breaking up of adhesions, realigning collagen and also maintain joint mobility by reducing biological changes in synovial fluid and their enhanced exchange. Maitland technique is thought to increase the proprioceptive and kinesthetic sensation in the joint thus individuals can do the activities in a newly gained range of motion.

Mulligan technique combines a sustained application of a manual gliding force to a joint with concurrent physiologic (osteo-kinematic) motion of the joint either actively by the patient or passively by the therapist.

Mobilization with intense capsular stretching causes tissue remodeling refers to a physical rearrangement of the connective tissue extracellular matrix (fibers, crosslinks, and ground substance) and collagenous tissues respond to increased tensile loading by increasing the synthesis of collagen and other extracellular components. Studies have shown that mechanical force during mobilization may include breaking up of adhesions, realigning collagen, or increasing fiber glide when specific movements stress the specific parts of the capsule.

The rehabilitative process of the overhead athlete represents a significant challenge to the clinician. Overhead athletes (thrower, tennis player, swimmer) repetitively subject their shoulder joints to high microtraumatic stresses that, due to the accumulative effects, may lead to a variety of shoulder injuries. This type of athletic patient exhibits uniquely specific physical characteristics, such as hypermobility of the anterior shoulder capsule, excessive external rotation, hypomobility of the posterior capsule, limited internal rotation, and generalized ligamentous laxity of the glenohumeral joint. However, the overhead athlete must exhibit functional stability for pain-free sports participation. Functional stability is accomplished through the proficient balance of static (passive) and dynamic (active) stabilizers. During the rehabilitation process, various concepts, such as neuromuscular control, proprioception, force couple efficiency, plyometrics, eccentrics, and scapular stability, can enhance dynamic functional stability for the overhead athletes. **Arrigo C, Wilk KE.**

Studies have also shown that mulligan MWM technique stretches the tightened soft tissues and also improve the normal extensibility of the shoulder capsule and normalizes the abnormal scapulohumeral rhythm to induce beneficial effect. Mulligan technique was selected because it not only improves ROM it also has analgesic effect.

In another study done by Doner et al says that Mulligan technique was compared with the stretching technique because stretching exercises are the mainstay of exercises in joint limitations; however, in contrast to Mulligan's technique they lack an analgesic effect., were he successfully demonstrated that mulligan technique with stretching exercises was better.

In my study Mulligan Mobilization Technique-Group A and Maitland Mobilization Technique-Group B was an effective treatment for Gleno Humeral Internal Rotation deficit in improving shoulder ROM, instability score and reducing pain. But between group analysis the result shows Group A Mulligan Mobilization Technique is more effective than Group B Maitland Mobilization Technique in improving shoulder ROM and it shows ineffective in bringing changes for pain and instability. That is both treatments gave equal effectiveness among the outcome measures of pain and instability.

It shows that there is a clinical significant improvement of patient's complaints in both groups. But the statistical inference shows that there is significant improvement in Group A when compared with Group B in improving shoulder ROM alone. That is Mulligan Mobilization Technique with stretching is more effective in treating overhead athlete with Glenohumeral Internal Rotation deficit.

This study shows that mulligan mobilization technique with stretching is more effective than Maitland mobilization technique with stretching to the overhead athletes with glenohumeral internal rotation deficit.

SUMMARY & CONCLUSION

CHAPTER VI

SUMMARY AND CONCLUSION

SUMMARY:

The aim of the study was to assess the changes occurring in the musculoskeletal system after Mulligan Mobilization Technique with stretching and stabilization exercise and Maitland Mobilization Technique with stretching and stabilization exercise in Gleno Humeral Internal Rotation deficit subjects.

A total number of 30 subjects were selected by Random sampling method after considering the inclusion and exclusion criteria. The informed consent were obtained from subjects individually.

Shoulder Internal Range of Motion (ROM), Numerical pain rating scale (NPRS), and Oxford Instability score (OSI) were taken as the parameters to measure. Pre-test and post-test value of Group A and Group B where obtained and compared by using Paired 't' test and Independent 't' test.

CONCLUSION:

Mulligan Mobilization Technique with stretching and stabilization exercise Group A and Maitland Mobilization Technique with stretching and stabilization exercise Group B both are effective in the treatment of Gleno Humeral Internal Rotation deficit. These techniques showed clinical and statistical significant effectiveness on these parameters.

The study is intended to compare the effectiveness between Mulligan Mobilization Technique with stretching and stabilization exercise and Maitland Mobilization Technique with stretching and stabilization exercise in the treatment of Gleno Humeral Internal Rotation deficit.

The result of the scores shows that, is a instability and pain reduction in both groups, improvement of range of motion in Shoulder internal rotation. There is an improvement in the functional activities of patients in both groups.

It shows that there is a clinical significant improvement of patient's complaints in both groups. But the statistical inference shows that Mulligan mobilization technique is more effective when compared to the Maitland mobilization technique in improving range of motion but for pain and instability it shows insignificant results. That is Mulligan Mobilization technique with Stretching and stabilization exercise is more effective in the treatment of Gleno Humeral Internal Rotation deficit.

LIMITATIONS & RECOMMENDATIONS

CHAPTER VII

LIMITATIONS AND RECOMMENDATIONS

- This study was done on subjects with age groups 18-40 years old. Can be planned for in other age group also.
- This study was planned for the PG curriculum, planned for 7 months. The future study can be expanded to under duration and can collect more samples to find out the effectiveness. May be increasing the samples may show the exact effectiveness of each technique in a better way.
- According to the inclusion criteria with in this short duration of 7 months got 30 patients totally. If we extend the study duration we might have more samples.
- The prevalence rate was not find in this study. We can also include this along with other demographic descriptive analysis.
- The beneficial treatment effect can be followed for the persistence of recovery.
- In this study the intervention duration planned was 6 weeks as per the literature reviews.
- This can be increased to find out the maximum effect.

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APPENDICES

APPENDICES

APPENDIX I

PHYSIOTHERAPY ASSESSMENT CHART

SUBJECTIVE EXAMINATION:

Date of Assessment:

Name :

Age :

Sex :

Occupation :

Address :

Chief complaints :

HISTORY

Present medical history :

Past medical history :

Drug history :

Surgical history :

Personal history :

Family history :

Socioeconomic history :

Psychological history :

Environmental history:

Associated problems :

PAIN HISTORY

Site :

Side :

Onset :

Duration :

Type :

Nature :

Frequency :

Aggravating factors :

Relieving factors :

Intensity: visual analogue scale (VAS)

_____

0 10

Vital signs

Temperature Blood pressure

Heart rate Respiratory rate

OBJECTIVE EXAMINATION

ON ONSERVATION

Built :

Posture :

Attitude of limbs :

Tropical changes :

Swelling :

Bony contours :

Deformities :

External appliances :

ON PALPATION

Warmth :

Tenderness :

Edema :

Pulse :

Trigger points :

ON EXAMINATION

Range of motion :

End feel :

Muscle power :

Muscle girth :

Posture :

Gait :

Functional assessment :

Other system assessment :

SPECIAL TEST

INVESTIGATION

DIAGNOSIS

PROBLEM LIST

AIMS

MEANS

HOME PROGRAMME

APPENDIX II

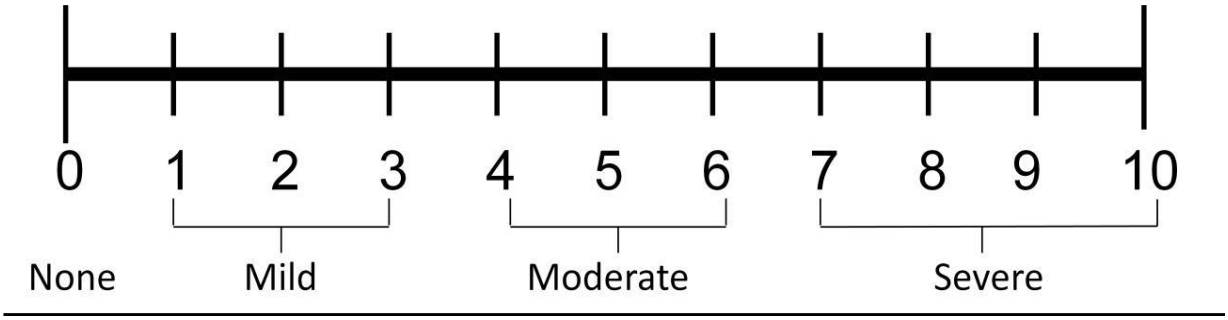
The Numeric Pain Rating Scale

Instructions

GENERAL INFORMATION:

- The patient is asked to make three pain ratings, corresponding to current, best and worst pain experienced over the past 24 hours.

- The average of the 3 ratings was used to represent the patient's level of pain over the previous 24 hours.



APPENDIX III

OXFORD SHOULDER INSTABILITY SCORE

RIGHT ☐
LEFT ☐

Problems with your shoulder

✓ tick **one** box for each question

1 During the last **6 months** …

how many times has your shoulder slipped out of joint (or dislocated)?

Not at all in **6 months**	1 or 2 times in **6 months**	1 or 2 times **per month**	1 or 2 times **per week**	More often than 1 or 2 times/week
☐	☐	☐	☐	☐

2 During the last **3 months** …

have you had any trouble (or worry) with putting on a T-shirt or pullover *because of your shoulder*?

No trouble/ no worries	Slight trouble or worry	Moderate trouble or worry	Extreme difficulty	Impossible to do
☐	☐	☐	☐	☐

3 During the last **3 months** …

how would you describe the worst pain you have had *from your shoulder*?

None	Mild ache	Moderate	Severe	Unbearable
☐	☐	☐	☐	☐

4 During the last **3 months** …

how much has *the problem with your shoulder* interfered with your usual work? (including school or college work, or housework)

Not at all	A little bit	Moderately	Greatly	Totally
☐	☐	☐	☐	☐

5 During the last **3 months** …

have you avoided any activities due to *worry about your shoulder* – feared that it might slip out of joint?

No, not at all	Very occasionally	Some days	Most days or more than one activity	Every day or many activities
☐	☐	☐	☐	☐

6 During the last **3 months** …

has *the problem with your shoulder* prevented you from doing things that are important to you?

No, not at all	Very occasionally	Some days	Most days or more than one activity	Every day or many activities
☐	☐	☐	☐	☐

Oxford Instability Shoulder Score

7 During the last **3 months** …

how much has *the problem with your shoulder* interfered with your social life? (including sexual activity – if applicable)

Not at all	Occasionally	Some days	Most days	Every day
☐	☐	☐	☐	☐

8 During the last **4 weeks** …

how much has *the problem with your shoulder* interfered with your sporting activities or hobbies?

Not at all	A little/ occasionally	Some of the time	Most of the time	All of the time
☐	☐	☐	☐	☐

9 During the last **4 weeks** …

how often has your shoulder been 'on your mind' – how often have you thought about it?

Never, or only if someone asks	Occasionally	Some days	Most days	Every day
☐	☐	☐	☐	☐

10 During the last **4 weeks** …

how much has *the problem with your shoulder* interfered with your ability – or willingness – to lift heavy objects?

Not at all	Occasionally	Some days	Most days	Every day
☐	☐	☐	☐	☐

11 During the last **4 weeks** …

how would you describe the pain you *usually* had from your shoulder?

None	Very mild	Mild	Moderate	Severe
☐	☐	☐	☐	☐

12 During the last **4 weeks** …

have you avoided lying in certain positions, in bed at night, *because of your shoulder*?

No nights	Only 1 or 2 nights	Some nights	Most nights	Every night
☐	☐	☐	☐	☐

APPENDIX IV

Shoulder Stabilization Exercises		
Exercise	**Movement**	**Muscles activated/ strengthened**
1. Scaption with thumbs up	Arm raise in the plane of the scapula to below horizontal with elbows slightly bent and thumbs up	Scapular stabilizers – rhomboids, trapezius, levator scapulae, serratus anterior, pectoralis minor
2. Shoulder abduction in the scapular plane*	Arm raise in the plane of the scapula, starting with the thumbs down and rotating thumbs up as the humerus moves toward and then beyond horizontal	Subscapularis, anterior deltoid, posterior deltoid, supraspinatus, infraspinatus, teres minor
3. Rowing	Active scapular retraction and depression, with shoulder extension	Rhomboids, trapezius
4. Push-up plus	Active scapular protraction at the terminal end of a push-up motion (serratus "punches")	Serratus anterior, pectoralis minor
5. Seated press-up	Pressing up to lift torso off seat	Rhomboids, pectoralis minor, pectoralis major, latissimus dorsi
6. Horizontal abduction with external rotation	Reverse fly with shoulders externally rotated and thumbs pointing backward	Infraspinatus, teres minor, posterior deltoid

APPENDIX-V

PATIENT CONSENT FORM

I……Voluntarily consent to participate in the research named on "**COMPARE THE EFFECTIVENESS OF MULLIGAN MOBILIZATION TECHNIQUE VERSUS MAITLAND MOBILIZATION TECHNIQUE ALONG WITH STRETCHING ON SHOULDER INTERNAL RANGE OF MOTION, PAIN AND INSTABILITY IN OVERHEAD ATHLETS WITH GLENO HUMERAL INTERNAL ROTATION DEFICIT".** The researcher has explained me the treatment approach in brief, risk of participation and has answered the questions related to the study to my satisfaction.

Signature of patient **Signature of researcher**

Signature of witness

Place:

Date:

APPENDIX-VI

DATA VALUES

TABLE: 1

MULLIGAN MOBILIZATION TECHNIQUE WITH STRETCH

DATA VALUE

SUBJECT NO	MULLIGAN MOBILIZATION TECHNIQUE WITH STRETCH					
	PAIN		IR ROM		OSI Score	
	Pre	Post	Pre	Post	Pre	Post
1	5	1	45	70	40	53
2	2	0	42	65	45	54
3	0	0	45	65	50	55
4	3	0	48	60	48	51
5	3	0	45	62	45	54
6	5	1	40	60	46	50
7	4	1	48	65	48	52
8	4	0	40	63	48	54
9	7	2	35	60	35	50
10	5	1	38	56	39	48
11	0	0	55	70	52	56
12	4	1	50	67	48	54
13	6	2	45	67	40	52
14	2	0	40	63	45	55
15	7	1	35	60	36	51

TABLE : 2

MAITLAND MOBILIZATION TECHNIQUE WITH STRETCH DATA VALUE

SUBJECT NO.	MAITLAND MOBILIZATION TECHNIQUE WITH STRETCH					
	PAIN		IR ROM		OSI Score	
	Pre	Post	Pre	Post	Pre	Post
1	6	2	40	55	40	46
2	0	0	45	58	52	55
3	3	0	50	60	48	51
4	2	0	55	67	48	52
5	7	3	35	48	38	43
6	4	1	45	57	45	51
7	5	2	35	50	45	49
8	0	0	42	53	50	54
9	7	4	48	60	35	46
10	2	0	50	62	46	51
11	3	1	52	65	48	53
12	8	4	55	68	36	44
13	0	0	40	55	50	53
14	4	1	45	58	48	53
15	2	0	40	53	50	55